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REMARKS

Claims 3-5, 7, 8, 11-16, and 26-36 stand rejected. Claim 27 is objected to and has been amended as suggested by the Examiner on Page 2 of the Office Action. Claim 11 has been amended to correct antecedent basis. Claim 30 has been amended to delete "linear". These amendments do not introduce new matter.

Rejections under 35 U.S.C. §103

Claims 29 and 35 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,760,391 by Narendran (hereinafter "Narendran") in view of U.S. Patent No. 6,272,157 by Broutin et al. (hereinafter "Broutin). Claim 29 recites, among other elements, a variable edge filter with a tapered spacer region. The Examiner states that Broutin teaches that edge filters are functional equivalents to etalon-based bandpass filters, and that it would have been obvious to substitute an edge filter in the optical wavelength analyzer of Narendran. The Applicants respectfully traverse.

In order to maintain a rejection under 35 U.S.C. § 103 three criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure.

As a threshold, the Applicants respectfully submit that Broutin does not teach that edge filters are functional equivalents to etalon-based bandpass filters. Broutin merely states that a variety of filters may be used in the laser system described therein. Neither reference provides suggestion or motivation to substitute an edge filter in the optical wavelength analyzer of Narendran. Narendran states that light is maximally transmitted through the wedge Fabry –Perot detector at positions where the optical path length is equal to half the wavelength of the light (Col. 5, lines 61-64). This is the description of a bandpass filter. Narendran provides a complete and functional optical wavelength analyzer, so there would have been no reason to substitute the bandpass filter described therein with an edge filter. Furthermore, because Narendran uses a

bandpass filter for peak detection, it teaches away from using an edge filter.

If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious. *In re Ratti* , 270 F.2d 810, 123 USPQ 349 (CCPA 1959). The Examiner states that the edge filters are routinely used to isolate a desired wavelength range. The optical wavelength analyzer of Narendran is a peak detector (*see* Abstract). Referring to Fig. 6, Narendran shows multiple Bragg gratings **38, 40, 42** reflecting multiple peaks λ_1, λ_2, λ_3. If the wedge Fabry-Perot filter **58** were an edge filter, all pixels in the linear diode array **36** would be illuminated by any peak within the pass portion of the edge filter, as taught on page 12, lines 14-17 of the *Written Description* of the instant patent application. A peak intensity would not be produced by the modification the Examiner suggests, and thus the proposed modification would change the principle of operation of the peak detector of Narendran.

Therefore, the Applicants believe claims 29 and 35 are allowable, and that claim 28 is allowable for at least the reasons provided in support of claim 29.

Claims 3, 4, 7, 8, 11, 12, 27, and 32 stand rejected as being unpatentable over Narendran in view of U.S. Patent No. 6,278,549 by Gaebe. Independent claim 11 recites, among other elements, a variable filter having a thermal stability of less than or equal to 50 parts per million per degree Centigrade of ambient temperature change. The Examiner cites Gaebe for disclosing a mirror/material structure for an etalon filter that provides thermal stabilities lower than 50 ppm/°C within the same optical wavelength range and temperature range. The Examiner states that it would have been obvious to substitute the mirror structures as well as the mirror and taper materials disclosed in Gaebe for the mirrors and tapered region of Narendran. The Examiner further states that improved thermal stability provides improved resolution in etalon devices. The Applicants respectfully traverse the Examiner's position.

In order to maintain a rejection under 35 U.S.C. § 103 there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Furthermore, the mere fact Narendran may be modified as suggested by the Examiner, does not make the modification obvious *unless the prior art suggests the desirability* for the modification. *In re Fritch*, 922 F.2d 1260, 23 USPQ.2d 1780 (Fed Cir. 1992) (*emphasis added*). Recent court

decisions have held that the motivating suggestion must be explicit. *Winner International Royalty Corp. v. Wang*, 48 USPQ.2d 1139 (D.C. D.C. 1998). The optical wavelength analyzer of Narendran does not suggest the modification proposed by the Examiner. To the contrary, Narendran appears unconcerned with the affect of ambient temperature (*see, e.g.* Col. 6, lines 45-50), particularly when making differential measurements.

The Examiner states that Gaebe provides a solution for improved thermal stability, and thus improved resolution in etalon devices (*i.e.* the wavelength analyzer of Narendran). The Applicants traverse the Examiner's position. The Applicants respectfully submit that thermal stability does not affect the peak wavelength resolution of Narendran, and thus the motivation asserted by the Examiner is lacking. A citation to a reference in support of the Examiner's position in accordance with MPEP §2144.03 or withdrawal of this rejection is respectfully requested.

The prior art references must teach or suggest all the claim limitations. Neither reference teaches a variable bandpass filter having a thermal stability of less than or equal to 50 ppm/°C. The optical filter disclosed in Gaebe appears to be a fixed-wavelength filter (*see, e.g.* Fig. 5). This provides consistent thin film thickness, which allows the thermal expansion of the substrate to stretch the thin films upon heating (Col. 3, lines 63-67), compensating for the thermal increase in thickness of the thin film layers. The thickness of the substrate is carefully chosen in accordance with the thin film structure to avoid over- or under-compensation. In a variable Fabry-Perot filter the thickness of the thin film structure (*e.g.* the spacer layer) is not constant. Gaebe does not disclose or suggest the recited variable bandpass filter, and the Applicants believe that claim 11 and all claims that depend from claim 11 are patentable, and that claims 14, 26, 27, 30 and all claims that depend therefrom are patentable for at least the reasons given above.

Dependent claim 12 recites an optical detector array having a length along the taper direction of less than or equal to 12 mm. The Examiner acknowledges that neither reference discloses a length of a detector array, and that it would be obvious to simply choose a detector array as needed. The Applicants respectfully direct the Examiner's attention to page 3, lines 21-25 and page 5, line 26 to page 6, line 3. The Applicant's teach that a small detector array is particularly desirable when using potentially expensive compound semiconductors and/or when a small footprint is desired. In a particular example, a spectral range from 1530-1570 nm (a 40 nm

range) is obtained over a run of 12 mm, and that a linear diode array having 256 elements on nominally 50 micron centers with an 80% fill factor is about 12 mm long. Similarly, the Applicants teach that the combination of an optical fiber, a magnifying lens, and a collimating lens that produces a collimated beam about 10 mm across is desirable. An optical detector array having a length of less than or equal to 12 mm makes efficient use of the collimated beam (Page 5, lines 8-11).

In comparison, Narendran discloses using a photodiode array having 2048 pixels and a variable filter having a low end of 1548 nm and a high end of 1552 nm (a 4 nm range) to obtain a resolution of about 0.0002 nm. Assuming a similar pixel spacing and fill factor, the photodiode of Narendran would be about 96 mm long. The Examiner appears to rely on his personal knowledge to state that optical detector arrays were commercially available at the time the instant invention was made that exceeded the required resolution and were less than 12 mm in length. The Applicants respectfully request an Affidavit in accordance with 37 C.F.R. §1.107 in support of the Examiner's assertion.

As discussed in MPEP § 2143.01, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify reference teachings, and the prior art must be considered in its entirety, including disclosures that teach away from the claims (MPEP §2141.02). Even if the wavelength analyzer of Narendran could use a 12 mm detector array, neither the reference nor the Examiner has provided any motivation for such modification. Such motivation comes only from the teachings of the Applicants. Narendran teaches away from using such small detector arrays by using relatively large arrays to achieve the desired peak wavelength resolution.

Accordingly, the Applicants believe that claim 12 is further patentable, and that claim 14 is patentable for at least similar reasons.

Independent claim 27 recites, among other elements, a linear optical detector array having *n* detectors and a calibration array for *m* calibration wavelengths wherein *m* is greater than *n*. The prior art references must disclose or suggest all elements of claim 27 in order to maintain this obviousness rejection. The Examiner states that that combination of Narendran and Gaebe disclose an analyzer electrically coupled to the linear optical detector array including a memory storing a calibration array. The Examiner acknowledges that Narendran uses interpolation for

greater resolution over the nominal resolution, and states that the calibration filter provides more wavelengths within the wavelength range than the number of pixels. However, claim 27 recites a calibration array with more wavelengths than the number of detectors.

Narendran does not disclose or suggest the recited calibration array. The Applicants respectfully direct the Examiner's attention to page 8, line 30 to page 9, line 16 of the *Written Description*. The calibration array having more calibration wavelengths than detectors is obtained by providing laser inputs at intervals less than the as-measured resolution. In contrast, Narendran states that "[a] standard calibration filter can be used to establish a relationship between wavelength and pixel number. The known wavelength (x) for the filter is assigned to the pixel number (n) corresponding to the peak intensity. Given the resolution (y), the wavelength for pixel number n-1 will be x-y, and so on." Col. 4, lines 37-42. The Examiner's attention is further directed to the broad-band light source 12 (Col. 2, line 67) shown in Fig. 1 that is presumably used with the standard calibration filter described above.

Narendran uses interpolation to determine the wavelength of a peak. Interpolation is defined as estimating a value of a function between two known values (*The New International Webster's Concise Dictionary of the English Language, International Encyclopedic Edition*, Trident Press Int'l (2000)). Interpolation is helpful in finding the wavelength of an assumed peak, as the wavelength analyzer of Narendran is intended to do, because the wavelength peak is relatively well behaved. In other words, the wavelength analyzer of Narendran assumes that the intensity will increase to a peak, and then decrease from the peak. If the peak wavelength occurs between detectors, and hence between wavelength calibration points, the trends of intensity on either side of the peak can be extended, their intersection representing the wavelength at which the peak is presumed to occur. Such interpolation techniques are not suitable for many types of applications, such as differentiating between two closely-spaced (*i.e.* closer than the nominal resolution) peaks, or measuring a non-peaked signal, such as a flat-top signal, and do not provide good amplitude accuracy for peaks occurring between detectors/calibration points.

A calibration performed according to Narendran does not obtain the recited calibration array. Narendran does not disclose or suggest how to obtain the recited calibration array, how to use the recited calibration array, or even why such an array would be desirable. Accordingly, the Applicants believe that claim 27 and all claims that depend from claim 27 are patentable, and that

claim 26 is patentable for at least similar reasons, and that claim 27 is further patentable for the reasons provided below in support of claim 26, namely the combination of a stable variable filter and a calibration array having for more wavelengths than there are detectors in the detector array.

Dependent claim 13 recites a variable bandpass filter with a 50% bandwidth of less than or equal to about 0.6 nm at a center wavelength between about 1530-1600 nm. In order to maintain a rejection under 35 U.S.C. § 103 there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference and the prior art references must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure.

Takashashi does not does not disclose or suggest the recited variable bandpass filter, hence the all-element requirement is not met and claim 13 is allowable.

The Examiner states that the tapered etalon in the wavelength analyzer of Narendran is capable of having a similar characteristic that would fall within the specified range for improved resolution. To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references. The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification. *In re Gordon*, 733 F.2d 900, 902; 221 USPQ 1125 (Fed. Cir. 1984). The Examiner has not provided a convincing line of reasoning why the recited filter would provide enhanced resolution in the wavelength analyzer of Narendran. The Applicants believe claim 13 is further allowable, and that claim 14 and all claims that depend from claim 14 are allowable for at least similar reasons.

Claims 26, 30, 31, 34, and 36 are rejected as being unpatentable over Narendran and Gaebe in view of U.S. Patent No. 5,144,498 by Vincent. Claim 26 recites, among other elements, an optical transmission network comprising an optical spectrometer component and an analyzer coupled to the optical spectrometer component so as to monitor each of at least some of a plurality of optical signals. The Examiner states that Narendran's invention is used specifically as a demultiplexer for WDM optical signals from the Bragg grating sensor. The Applicant

respectfully traverses the Examiner's position.

Narendran states that "[a] beneficiary of the Bragg grating technology is the optical communication industry. Such *gratings* can be used as filters for signal multiplexing (i.e. wavelength division multiplexing." Col. 6, lines 53-57 (*emphasis added*). Narendran goes on to state that the invention could be used to read the center wavelength of Bragg gratings. Narendran does not disclose or suggest using his invention as a demultiplexer to monitor WDM signals. The Applicants respectfully submit that this rejection is based on a mischaracterization of Narendran and request reconsideration of this claim and withdrawal of this rejection.

Furthermore, the prior art references must teach or suggest all the claim limitations. Narendran does not disclose or suggest an analyzer coupled to the Fabry-Perot detector so as to monitor each of some of a plurality of WDM optical signals in the manner recited in claim 26. Rather, Narendran discloses using his wavelength analyzer to monitor stress that affects a fiber Bragg grating. Col. 4, lines 43-51.

The Applicants teach that the combination of a variable filter with high thermal stability and a calibration technique as described provide an optical spectrometer that has sufficiently high resolution and sufficient stability to be used to monitor closely spaced optical signals. This combination is important to achieve a practical optical spectrometer. If the filter was not stable, the calibration would soon be invalid. In this instance, the recited stability is particularly desirable when used in conjunction with the resolution-enhancing calibration array. It is the Applicants' position that no reference or combination of references suggests claim 26, and that claim 26 is allowable, and that claim 27 is also allowable for at least this reason.

Claim 30 recites, among other elements, an input optical fiber configured to carry a plurality of WDM optical signals having a nominal channel spacing of about 200 GHz or less, an optical spectrometer having a thermal stability of less than 50 ppm/°C, and an analyzer coupled to the optical spectrometer component so as to monitor each of some of the WDM optical signals. The prior art references must teach or suggest all the claim limitations. Narendran does not disclose or suggest an analyzer coupled to the Fabry-Perot detector so as to monitor each of some of the plurality of WDM optical signals in the manner recited in claim 30. Therefore, the Applicants believe claim 30 and all claims that depend from claim 30 are allowable for the reasons given above, and for the reasons given above in support of claims 11 and 26.

CONCLUSION

The Applicants submit that all claims are now in condition for allowance. Timely issuance of a Notice of Allowance is respectfully requested. Should the Examiner consider necessary or desirable any formal changes anywhere in the specification, claims and/or drawings, then it is respectfully asked that such changes be made by Examiner's Amendment if the Examiner feels this would facilitate passage of the case to issuance. If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at (707) 591-0789.

Respectfully Submitted

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